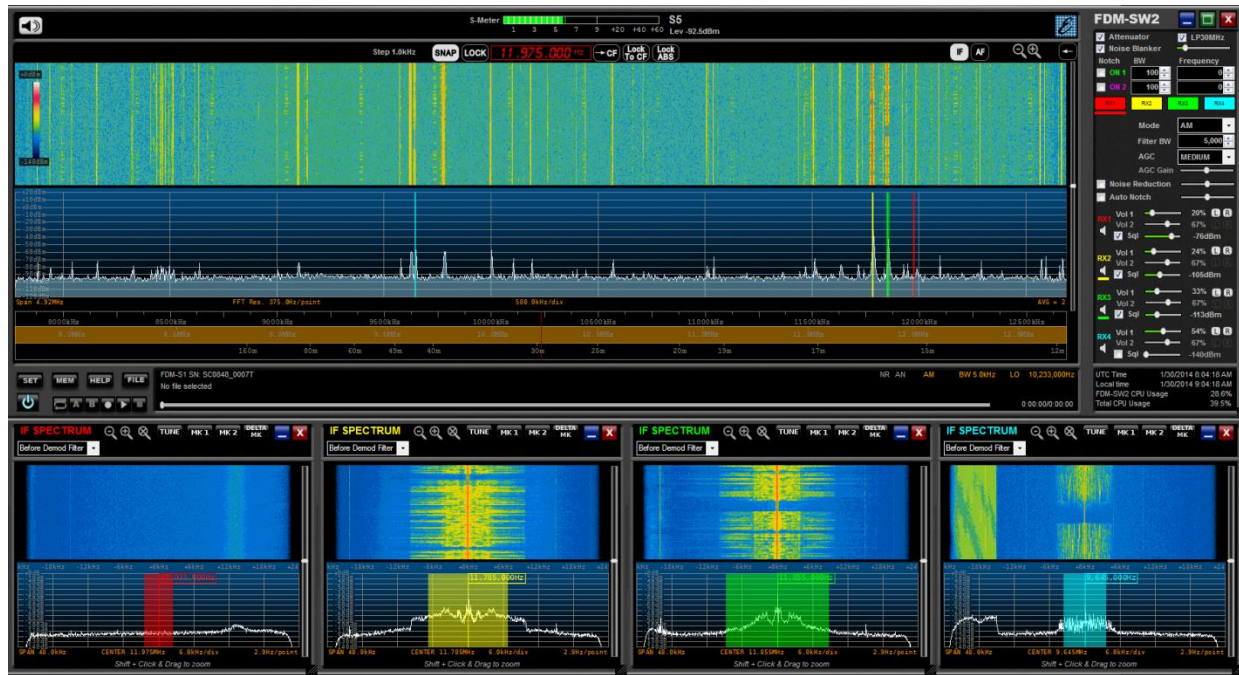


ELAD FDM-SW2



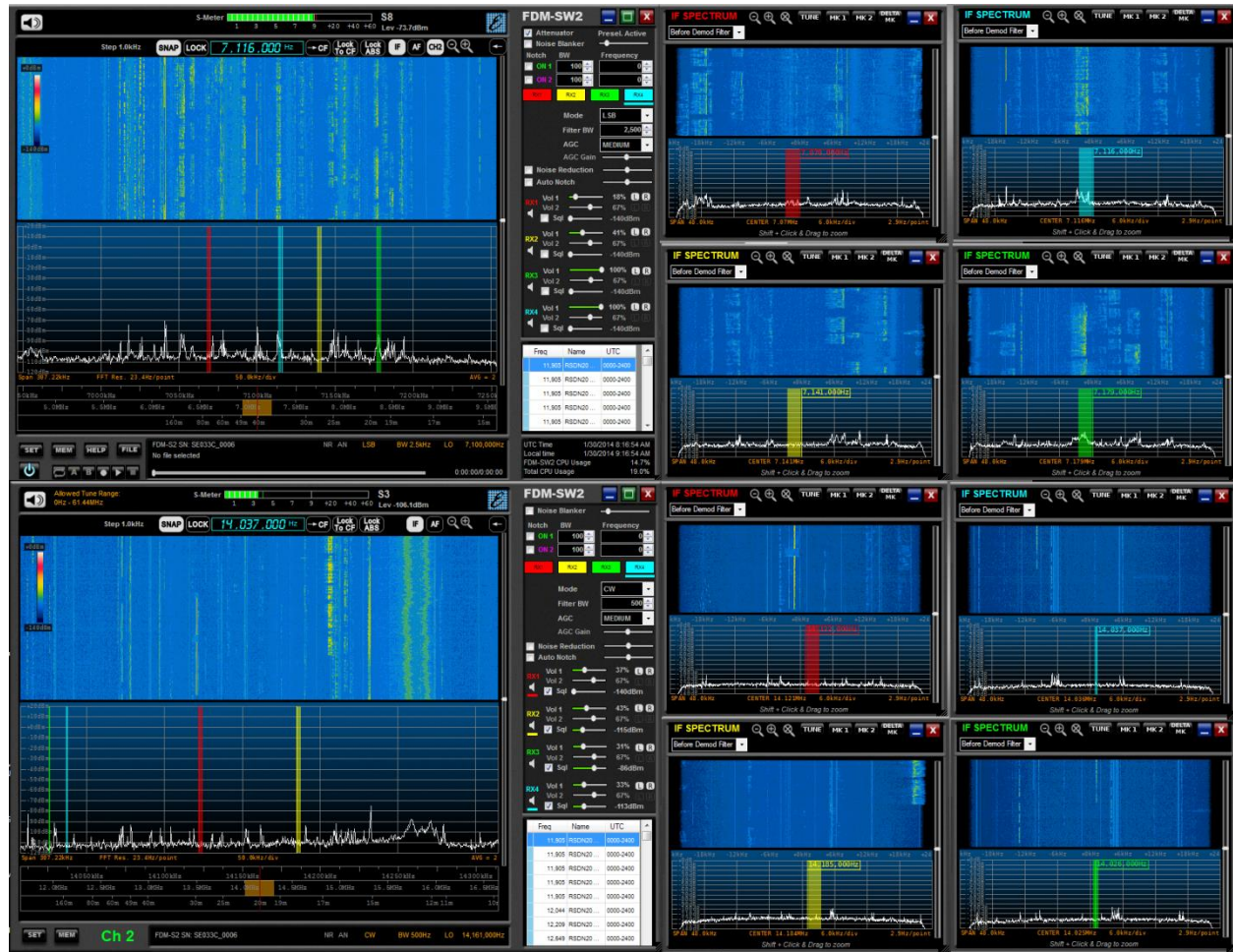
USER MANUAL

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1 FDM-SW2 Overview



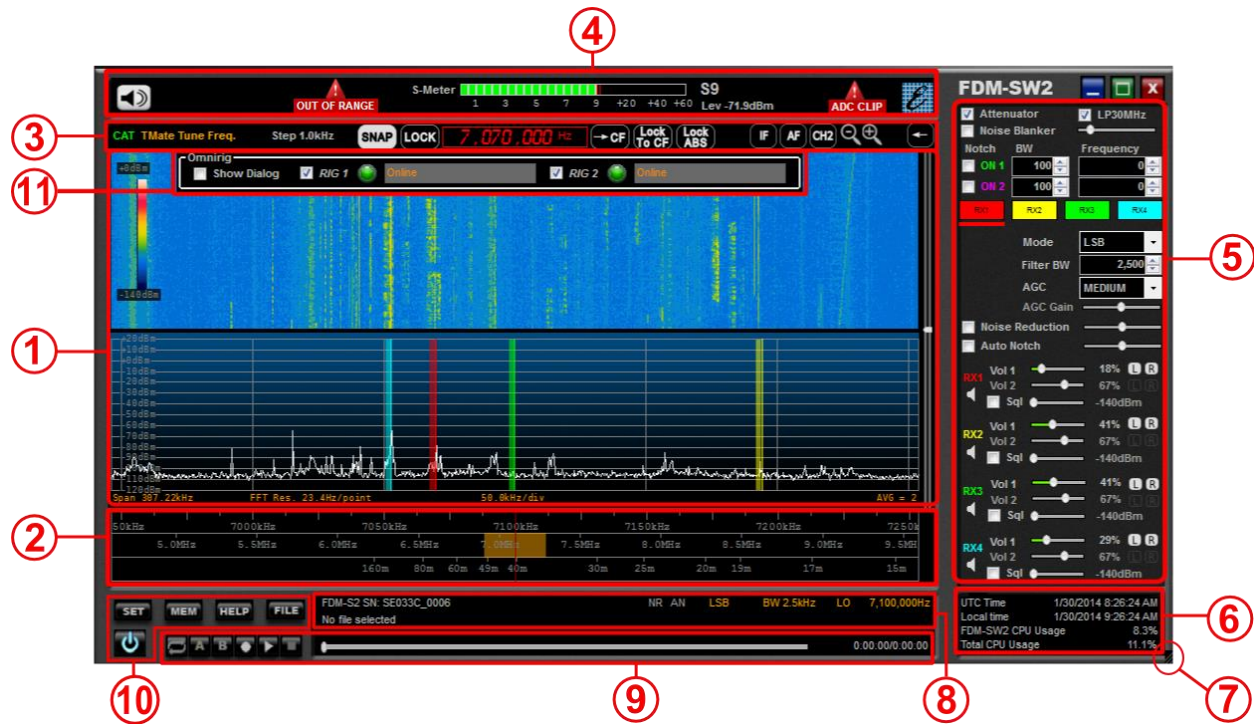
Elad FDM-SW2 is a SDR (Software Defined Radio) software that is intended to be used with the Elad FDM-Sx Receiver family.

Please check out the latest update of this document at www.eladit.com.

Note: this manual is based on FDM-SW2 ver. 1.00.

2 Graphical User Interface (GUI)

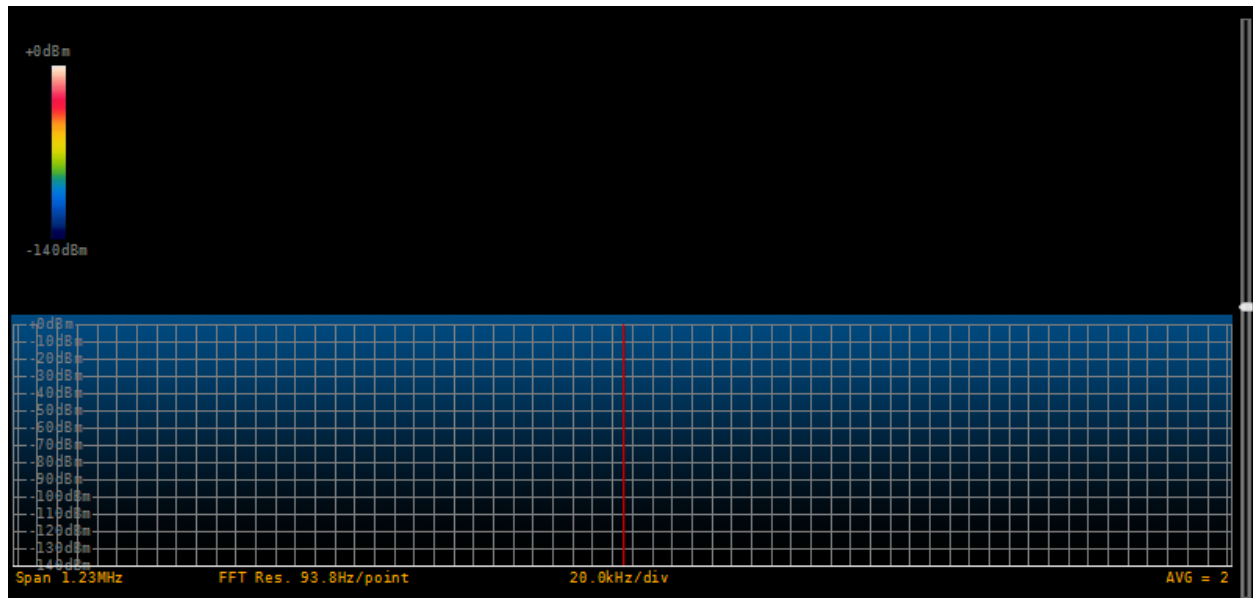
The screen shot below shows the main screen (the cockpit) of the Graphical User Interface.



The GUI consists of 11 parts:

1. Display Window;
2. Tuning Bars;
3. Tuning Commands Panel;
4. Signal Control Display;
5. Receiver Commands Panel;
6. System Info Panel;
7. Resize corner
8. Status Bar
9. Player/Recorder
10. Main Setting Buttons
11. Omnirig control panel

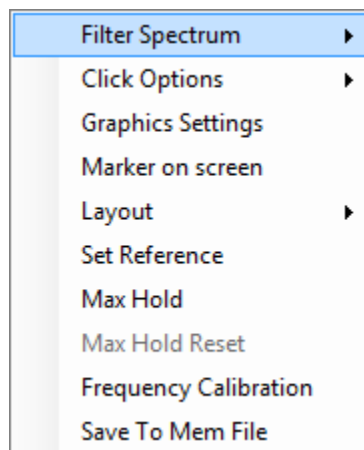
2.1 Display Window



The “Display Window” displays the Spectrum and the Waterfall of input signal. The sliding bar on the right side allows the user to change the area portions assigned to the two types of graphics.

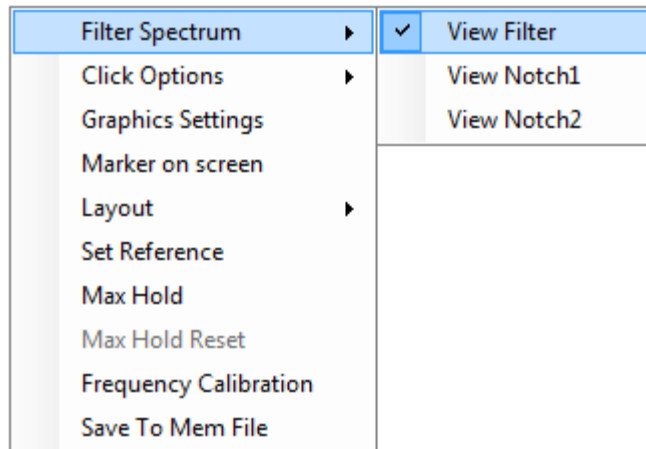
On the lower part, information about the current setting of “Span”, “FFT Res”, “kHz/div” and “AVG” is displayed.

When right-click is performed on the “Display Window” the software displays a pop-up menu that contains advanced options.



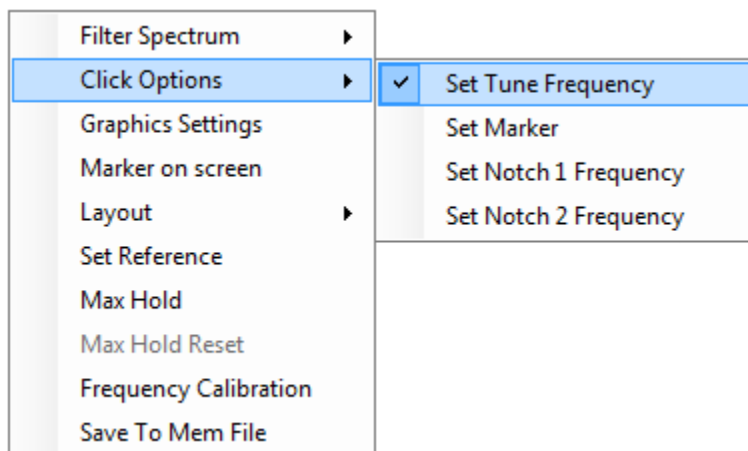
2.1.1 Filter Spectrum

Allows the user to select which information is displayed on the spectrum area.



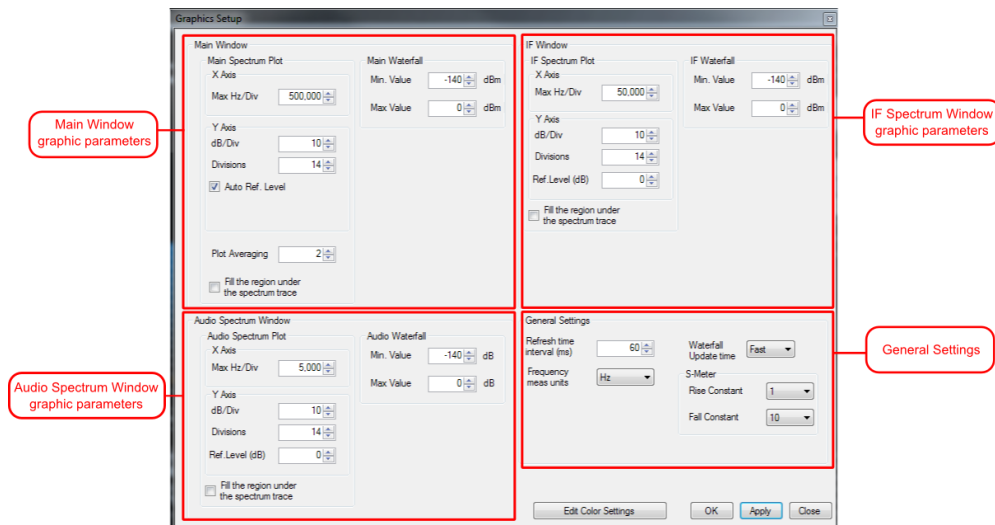
2.1.2 Click Options

Allows the user to select which kind of operation can be done when left-click is performed on the Spectrum area.



2.1.3 Graphics Setup

When this option is selected, the “Graphics Setup” form is displayed. This form allows the user to configure the parameters of the Spectrum/Waterfall graphics displayed in the “Display Window”. Moreover, in this form the user can customize the visualization of the “Audio Spectrum” form (see Chapter 6) and the “IF Spectrum” form (see Chapter 5) and others general settings like S-meter rise and fall time constants.

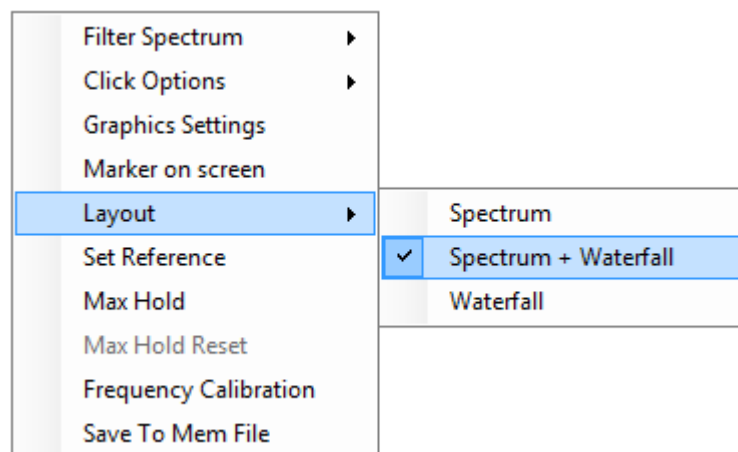


2.1.4 Marker on screen

This option enables the visualization of the marker on the Spectrum. The amplitude value (dBm) of the selected frequency is displayed on top-right corner of the “Display Window”.

2.1.5 Layout

Allows the user to select the visualization mode.



2.1.6 Set/Reset Reference

When “Set Reference” is selected, the software displays as a reference curve the input spectrum available at the moment of the selection. “Reset Reference” disables the visualization of the reference curve.

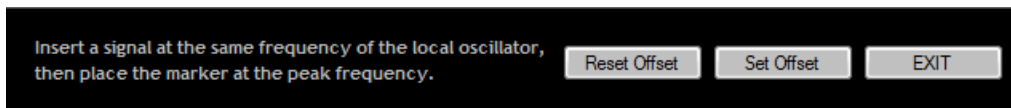
2.1.7 Max Hold

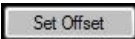
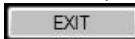
When “Max Hold” is selected, the software displays the max hold of the input spectrum together with the real-time input spectrum trace. Click “Max Hold Reset” to reset the max hold trace.

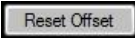
2.1.8 Frequency Calibration

This option allows the user to modify the factory sampling frequency offset of the Elad FDM-Sx Receiver family.

Normally this operation is not needed.



As described in the pop-up above, a reference signal at the same frequency of the L.O., has to be provided at the antenna input of the receiver to perform the frequency calibration. Then, place the marker on the reference (peak), press  and then .

Clicking on  button, the software resets the sampling frequency offset to zero.

NOTE:

This operation will cause the loss of the factory calibration. Perform this operation only if you are sure to accomplish the operation in the right way and to use a precise frequency reference.

2.1.9 Save To Mem File

When “Save To Mem File” is clicked, the “Add to Memory File” Form is displayed.

This form allow to add a new station in station memory file (See paragraph 3.7). The user can select the memory file and save the frequency, name and a default demodulation mode for the station.

2.2 Tuning Bars



These innovative tuning bars (Patent Pending) allow the user to perform fast tuning over the whole receiver bandwidth. Each bar is characterized by different frequency spans. By performing drag-and-drop or scrolling with the mouse wheel over the different bars, the user can easily select the desired frequency using the lower bar to select the frequency band, the middle bar to make a rough tuning and the higher bar to do fine positioning.

The span of the higher bar corresponds to the frequency range of the spectrum, and can be modified using the zoom buttons in the “Tuning Commands Panel”.

The frequency step of the higher bar (displayed in the “Tuning Commands Panel”) can be changed using the $\uparrow \downarrow$ arrows on the PC keyboard, while $\leftarrow \rightarrow$ keys increase or decrease the tuning frequency by one step respectively (see Chapter 3.2 for keyboard shortcut configuration).

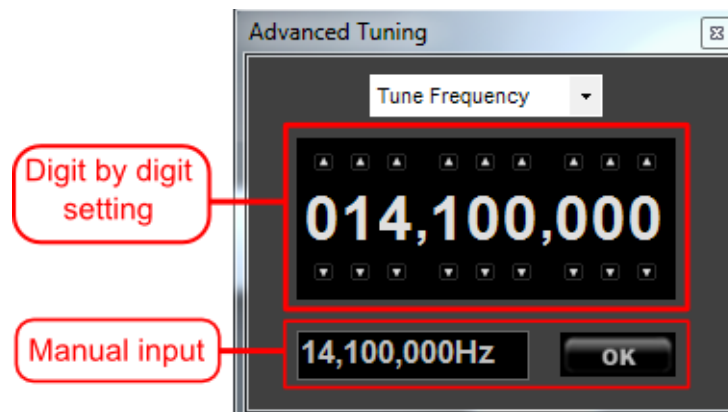
The yellow segment on the middle bar represents the portion of the spectrum displayed by the software in the “Display Window”.

2.3 Tuning Commands Panel





The main function of this panel is to display the tuning frequency.


Double click on the frequency display or press space bar (**7,070,000 Hz**) to open the “Advanced Tuning” panel.





In the “Digit by digit” section it is possible to modify the tuning frequency or the local oscillator frequency by moving the mouse over each digit and then scroll with the mouse wheel to increase or decrease the digit value. Alternatively the user can click on the small arrow button over and below each digit.


In the “Manual input” section it is possible to modify the tuning frequency or the local oscillator frequency inserting manually the desired value using the PC keyboard (Note: “+” key allow to insert “000”).


If the “LOCK TO CF” button is selected () the tuning frequency corresponds to the center frequency of the Spectrum (that is the L.O. frequency), otherwise it's possible to select different demodulation frequencies by clicking on the desired point on the Spectrum/Waterfall or using the mouse scroll wheel over the Spectrum/Waterfall area. If the “LOCK ABS” button is selected () the tuning frequency remains constant even if the local oscillator frequency is changed (until the tuning frequency falls within the selected frequency span; otherwise the tuning frequency will be set according to the frequency span limits).


If the “LOCK” button is selected () all the settings except the volume controls are disabled.

Clicking on  button the software forces the L.O. frequency to be equal to the current demodulation frequency.






Use the “SNAP” button () to enable/disable the rounding of the tuning frequency at multiples of the frequency step.


Use the “IF” button () to open the IF spectrum window. Left click on this button to open/close the IF window. If the IF window is open, right click on this button to move to foreground the IF window.



Use the “AF” button () to open the AF spectrum window. Left click on this button to open/close the AF window. If the AF window is open, right click on this button to move to foreground the AF window.

Use the “CH2” button () to open the Channel 2 window. Left click on this button to open/close the AF window. If the Channel 2 window is open, right click on this button to move to foreground the Channel 2 window.

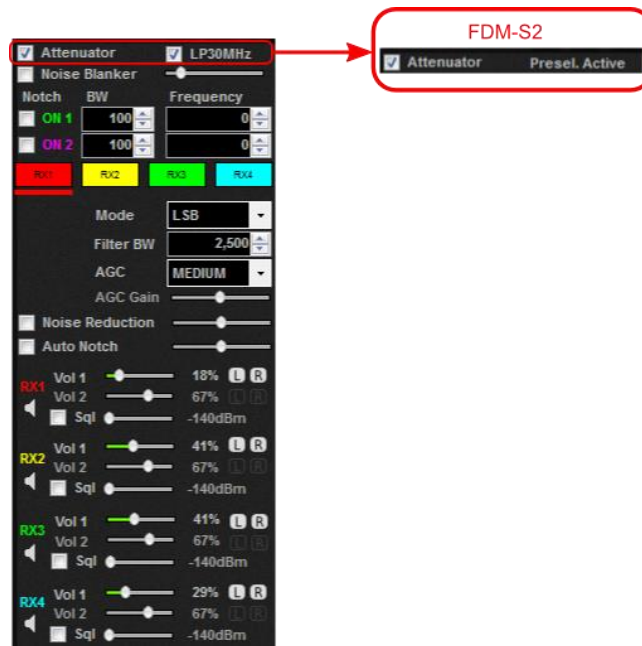
Note: this feature is available only if the connected sampler is a FDM-S2 and the selected hardware configuration supports two channels.

Buttons    implement “zoom in”, “zoom out” and “zoom reset” respectively. Use the arrows   that appear on the “Display Window” when zoom function is active to move left/right the visualization.



The button  hide the receiver setup.

Moreover, the “Tuning Commands Panel” shows the label  when a Tmate is connected and the label  when the CAT protocol is enabled.






2.4 Receiver Commands Panel



This panel allows the user to:

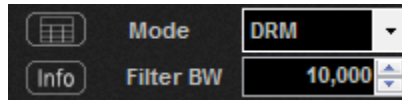
- Switch On/Off the anti-aliasing filter (30 MHz Low Pass) Only for FDM-S1;
- Switch On/Off the 20 dB attenuator (12 dB for FDM-S2);
- Switch On/Off the noise blanker and modify its level;
- Switch On/Off the two notch filters (at IF stage) and set their parameters (frequency and bandwidth);
- Turn On/Off and select the four virtual receiver (RX1 ... RX4) available for each channel 
- Select the demodulation mode for the selected RX (CW, CW SH+, CW SH-, USB, LSB, DSB, AM, SAM, FM, WB FM Stereo, DRM is available only for RX1 of Channel 1);
- Set the bandwidth of the demodulation filter for the selected VRX;
- Set the AGC type for the selected VRX
 - if "AGC OFF" is selected, the user could adjust the AGC Gain manually;
 - if "AGC OFF" is selected, the software displays a warning  when audio clipping is detected;
- Switch On/Off the "Noise Reducer" and modify its speed for the selected RX;
- Switch On/Off the "Auto Notch" reducer and modify its speed for the selected RX;


For each virtual receiver it is possible to:

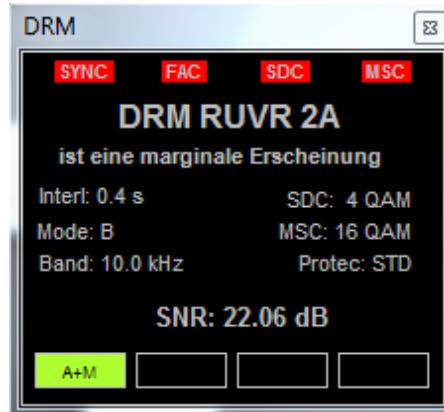
- Set the volume of the main audio output  18% ;
- Set the volume of the auxiliary audio output  67% ;
- Switch On/Off the squelch and set its level  -140dBm ;
- Mute the VRX (only for main audio output) 
- Send the output to the left/right or both channels of main and auxiliary audio output 


2.5 DRM Info Window and DRM Schedule

If the DRM mode is selected two buttons allows to show the DRM info window and the DRM schedule window



Clicking on  the DRM info window is displayed. This form displays some information about the DRM transmission



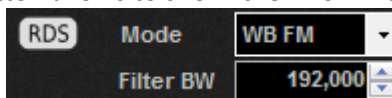
Clicking on  button, if an internet connection is available, the software automatically downloads and displays the last DRM schedule from <ftp://216.92.35.131>.

Start/Stop Time UTC	Days	Frequency	Target	Power	Programme	Language	Site	Country
0459-0758	Daily	13730	Pacific	25	RNZI	English	Rangitaki	New Zealand
0500-0530	Daily	17870	China	90	RRI	Chinese	Tiganesti	Romania
0500-0700	Daily	1296	Europe	35	BBC WS	English	Orfordness	Great Britain
0500-0800	Daily	3955	Europe	100	BBC WS	English	Skelton	UK
0500-0900	Daily	9780	Europe	100	REE	Spanish	Noblejas	Spain
0530-0600	Daily	6175	E Europe	90	RRI	Russian	Tiganesti	Romania
0600-0630	Daily	9650	Europe	90	RRI	French	Galbeni	Romania
0600-1000	Daily	11635	Europe	40	VoR	R/E	Taldom	Russia
0630-0700	Daily	9600	Europe	90	RRI	English	Galbeni	Romania
0700-0730	Daily	9450	Europe	90	RRI	German	Tiganesti	Romania
0700-0800	Daily	5875	Europe	40	BBC WS	English	Moosbrunn	Austria
0700-0800	---	6015	Europe	60	TDPradio	English	Iesoudun	France
0700-1610	-TWTF-	1611	Europe	25	Vatican Radio	various	Santa Maria	Vatican
0759-1058	Daily	9870	Pacific	25	RNZI	English	Rangitaki	New Zealand
0800-0900	-T---	6015	Europe	60	TDPradio	English	Iesoudun	France
0800-0900	Daily	5790	Europe	100	BBC WS	English	Skelton	Great Britain
0800-0900	Daily	5875	Europe	100	BBC WS	English	Woolferton	Great Britain
0800-1000	Daily	7325	Europe	15	VoR	R/E	Bolshakovo	Russia
0900-1000	-W---	6015	Europe	60	TDPradio	English	Iesoudun	France

If WB FM is selected as demodulation mode, the “RDS Info Panel” is activated. It displays the decoding of some RDS information.

2.6 RDS Window

If the WBFM mode is selected a button allows to show the RDS window.



Click on **RDS** button to open the RDS Window

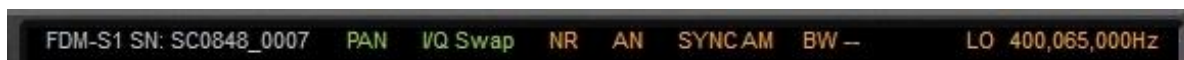


2.7 System Info Panel

UTC Time	2/4/2014 10:14:52 AM
Local time	2/4/2014 11:14:52 AM
FDM-SW2 CPU Usage	9.4%
Total CPU Usage	17.2%

This panel displays the system time (UTC and local) and the CPU usage.

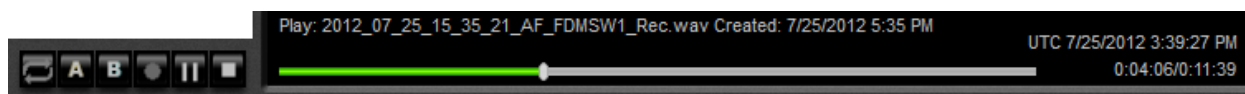
2.8 Status Bar



The “Status Bar” displays the following information:

- Serial number of the connected Elad FDM-Sx Receiver;
- Selected demodulation mode and filter bandwidth;
- Status of the “Noise Reducer” and “Auto Notch” (On or Off);
- Status of the “Panadapter Mode” (see Chapter 3.6)
 - If “Panadapter Mode” is activated, the **PAN** label is showed;
 - If AOR AR8600 Control is activated the **AR8600** label is showed;
 - If “Swap I/Q” option is selected, the **I/Q Swap** label is showed;
- Status of the “Downconverter Mode” (see Chapter 3.6)
 - If “Downconverter Mode” is activated, the **DW CONV** label is showed;
 - If “Swap I/Q” option is selected, the **I/Q Swap** label is showed;
- L.O. Frequency;

2.9 Player/Recorder




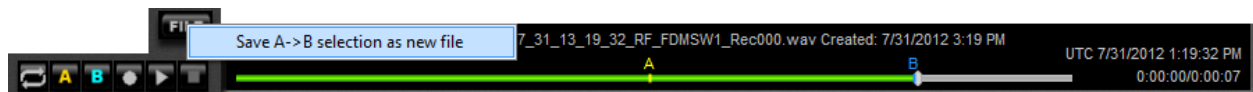
FDM-SW2 embeds an advanced player/recorder.

When the recorder is activated, the RF input signal or the audio output signal is stored in a .wav file (see Chapter 3.8). Some information regarding the settings used during the recording (file creation date, L.O. frequency, demodulation frequency, demodulation mode, filter bandwidth, etc.) is stored in the file's header.

When the file is played, the stored information is loaded by the software. When the playback is finished, last demodulation settings (demodulation frequency, demodulation mode and filter bandwidth) are stored again in the .wav header.

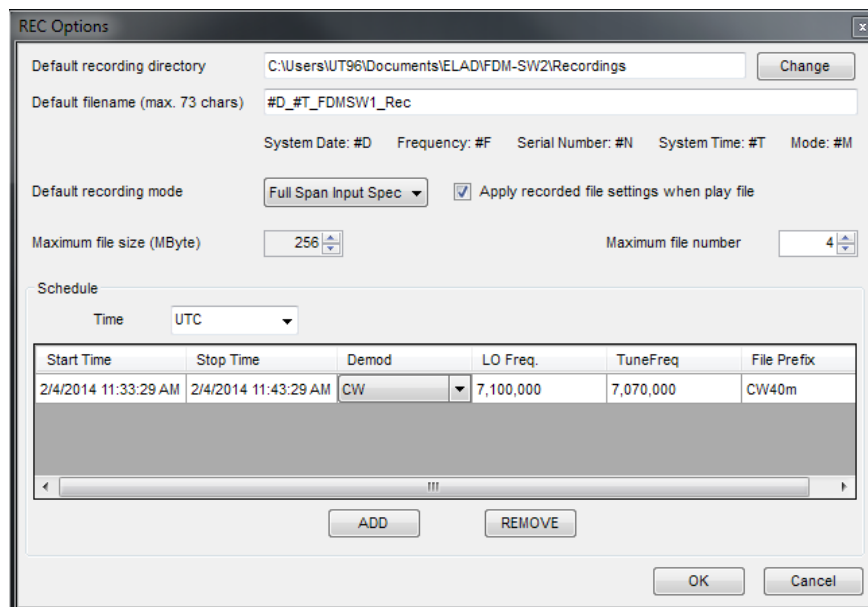
Six button function are available  (Loop, A, B, Rec, Play/Pause, Stop).

After placing "A" and "B" (when the reproduction is stopped), user can create a new file with the samples included between the two markers by right-clicking the  button and then click the Save A->B selection as new file label.



2.9.1 Recording Scheduler

When a right-click is performed on the Rec button, the "Rec Option Form" is displayed

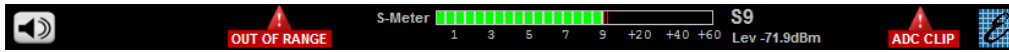


Start Time	Stop Time	Demod	LO Freq.	TuneFreq	File Prefix
2/4/2014 11:33:29 AM	2/4/2014 11:43:29 AM	CW	7,100,000	7,070,000	CW40m


This form allow the user to set the recoding options and schedule the recording of the input spectrum or the audio output signal.


The user can set the start and stop time of recording (UTC Time or Local Time), the demodulation mode, the local oscillator frequency, the tuning frequency and the file name prefix.


2.10 Signal Control Display




In this area, the FDM-SW2 software displays the level of the input signal.


The  signals an ADC saturation


The  (FDM-S2 only) appears when the local oscillator is tuned in a frequency range not implemented in the pre-selection filters.


Use the  button to activate or deactivate the Mute function.


2.11 Main Setting Buttons

Button  switches on/off the demodulation.

Button  opens the “Setup” form.

Button  opens the “Station List” form.

Button  opens the FDM-SW2 Guide. Refer this guide to know useful shortcut key functions.

Button  opens the Windows dialog box to allow the user to select the file to play.


2.12 Resize Corner

Drag-and-drop the bottom-right corner to resize the “Graphical User Interface”.


2.13 Omnirig Control Panel



This panel is displayed when the Omnirig control is active.

The  check box allows to show / hide the Omnirig configuration window and the other checkboxes allow to enable the management of the two rigs. In the other controls, are displayed the two rigs status.

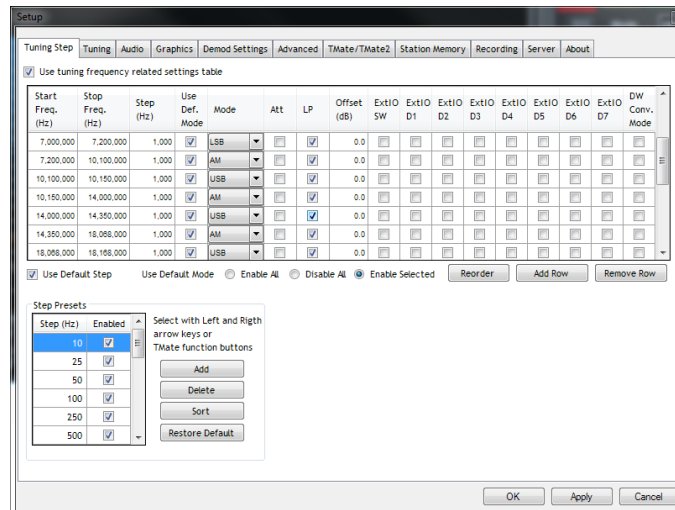
3 Setup Form

When the  button is clicked, FDM-SW2 displays the “Setup” form. This form contains several settings that control the behavior of the software.

The “Setup” form consists of 11 tabs:

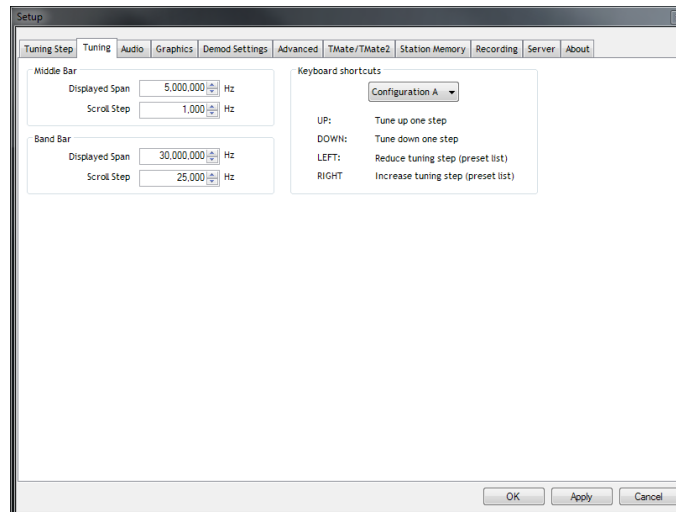
- 1 “Tuning Step” tab;
- 2 “Tuning” tab;
- 3 “Audio” tab;
- 4 “Graphics” tab;
- 5 “Demod Settings” tab;
- 6 “Advanced” tab;
- 7 “TMate/TMate2” tab;
- 8 “Station Memory” tab;
- 9 “Recording” tab;
- 10 “Server”
- 11 “About” tab;

3.1 Tuning Step Tab



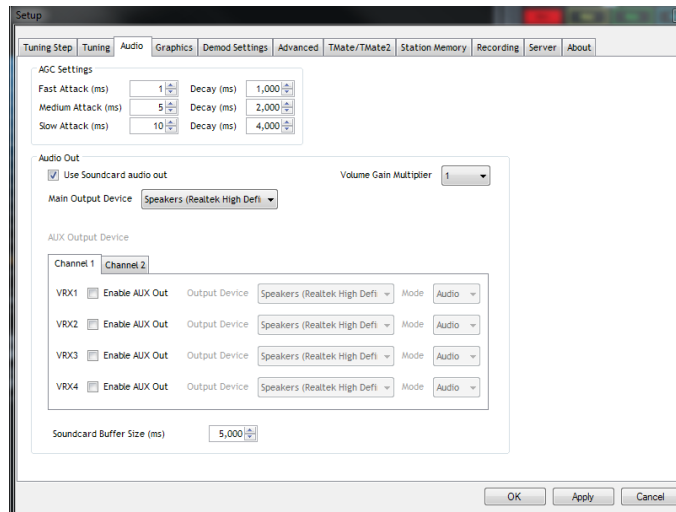
In the “Tuning Step” tab the user can configure the frequency steps that the software sets when the ← → arrows on the PC keyboard are pressed; these frequency steps are configurable under “Step Preset” area. Moreover, the user can compile a table containing custom setting (frequency step, demodulation mode, attenuator, low pass filter (FDM-S1 only), Ext I/O, down converter mode) that the software automatically applies if the tuning frequency falls within the user-defined frequency ranges: to make this, check “Use tuning frequency related settings table” on the top of the tab.

3.2 Tuning Tab



The “Tuning” tab allows the user to customize the frequency span of the “Middle” and “Band” (lower) tuning bars and the keyboard shortcuts configuration.

3.3 Audio Tab



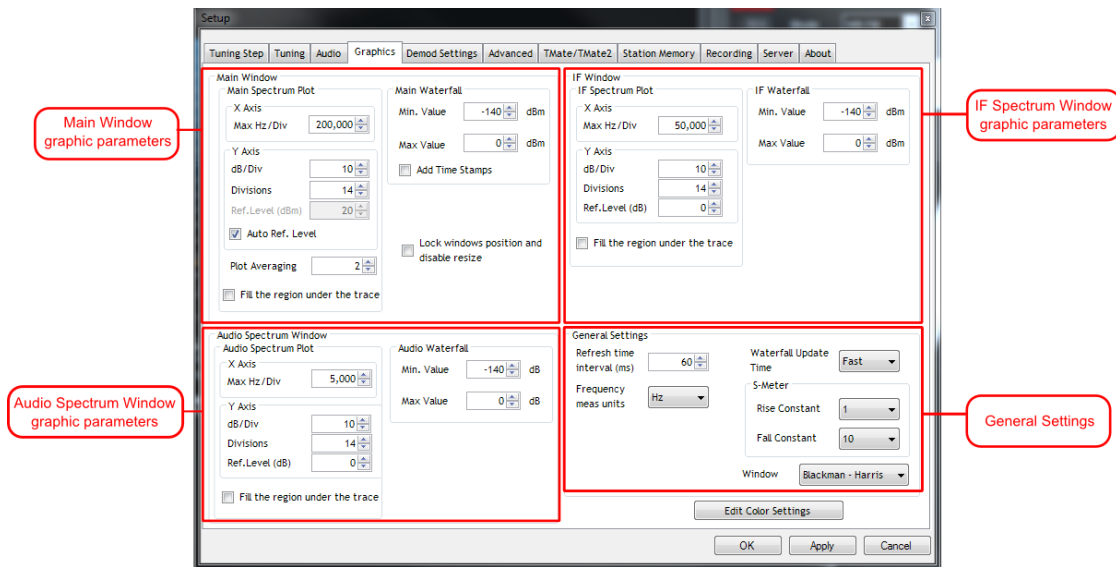
The “Audio” tab allows the user to select the main audio output device and an auxiliary output device (for example a virtual audio cable) for each of the virtual receivers.

When the “AUX” out is enabled, the user can select the data type that will be reproduced on this device:

- Audio (48 kSamples/sec)
- IF (192 kSample/sec)
- IF (48 kSample/sec)

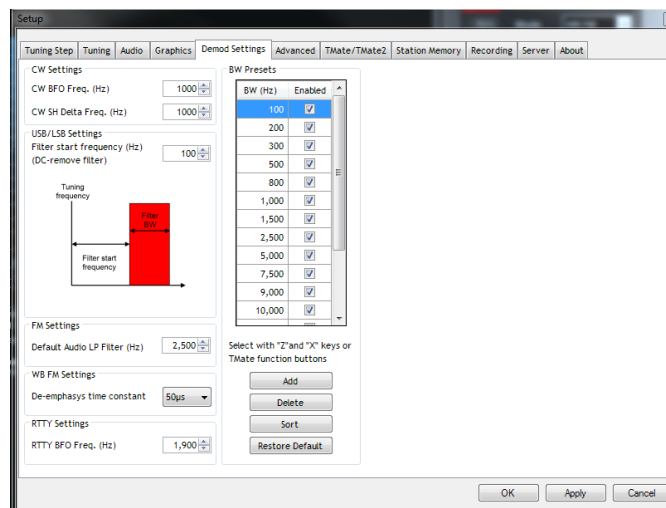
“Soundcard Buffer Size” allow the user to set the soundcard buffer time used when a recorded file is reproduced.

3.4 Graphics Tab



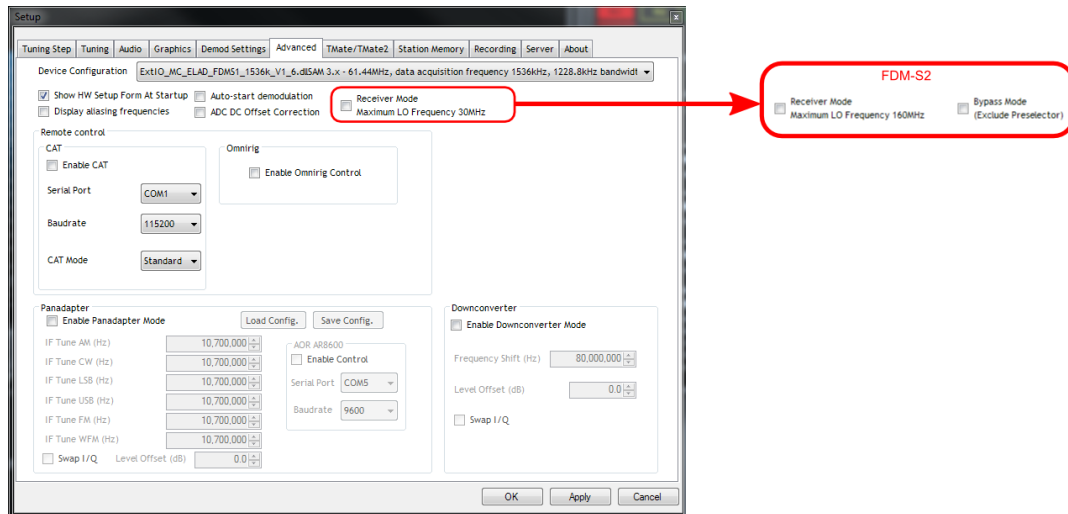
The “Graphics” tab allows the user to customize several parameters related to the “Display Window” visualization. Moreover, in this tab the user can enable and customize the visualization of the “Audio Spectrum” form (see Chapter 5), the “IF Spectrum” form (see Chapter 4) and the S-meter time constants.

3.5 Demod Settings Tab



The “Demod Settings” tab allows the user to customize several parameters related to the demodulation algorithms.

3.6 Advanced Tab



In this tab, the user can select the advanced options of the software.

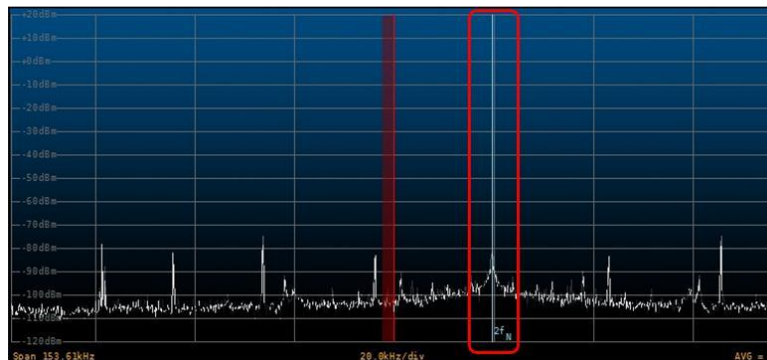
The combo box “Device Configuration” allows to change the device sampling frequency and if the connected device is a FDM-S2, it is possible to select a two-channel configuration.

If the connected device is a FDM-S1, if the ☒ **Receiver Mode** **Maximum LO Frequency 30MHz** checkbox is selected, the software operates in “Receiver Mode” and limits the maximum tunable frequency at the Nyquist frequency (half of the ADC sampling rate). If the checkbox is deselected, the software operates in “Sampler Mode” and unlocks the limitation.

If the connected device is a FDM-S2, if the ☐ **Receiver Mode** **Maximum LO Frequency 160MHz** checkbox is selected, the software limits the maximum tunable frequency at 160MHz. If the checkbox is deselected, the software operates in “Sampler Mode” and unlocks the limitation.

If the ☐ **Bypass Mode** **(Exclude Preselector)** checkbox is selected, the pre-selection filters are excluded. This option is disabled by default.

If the “Sampler Mode” is activated, the user can force the software to highlight the multiples of the Nyquist frequency on the Spectrum by checking the ☒ **Display aliasing frequencies** checkbox.



Checking the ☒ Show HW Setup Form At Startup Receiver Mode checkbox, the “FDM-SW2 Hardware Setup” form is loaded at software startup (see Chapter 7).

To enable the DC offset correction feature of the ADC, check the ☒ ADC DC Offset Correction checkbox; this option removes ADC offset at 0 Hz.

3.6.1 CAT

When the CAT control is active, the “Tuning Commands Panel” displays the **CAT** label. In the “CAT Panel” the user can configure the serial communication settings.

The FDM-SW2 implements the command set of the Yaesu FT-897 transceiver.

3.6.2 Omnirig

When the ☐ Enable Omnirig Control is checked, the FDM-SW2 software can control two transceivers using the Omni-Rig technology.

Please go to website <http://dxatlas.com/OmniRig/> for more information about Omni-Rig.

Note: Omnirig must be installed in your PC.

3.6.3 Panadapter

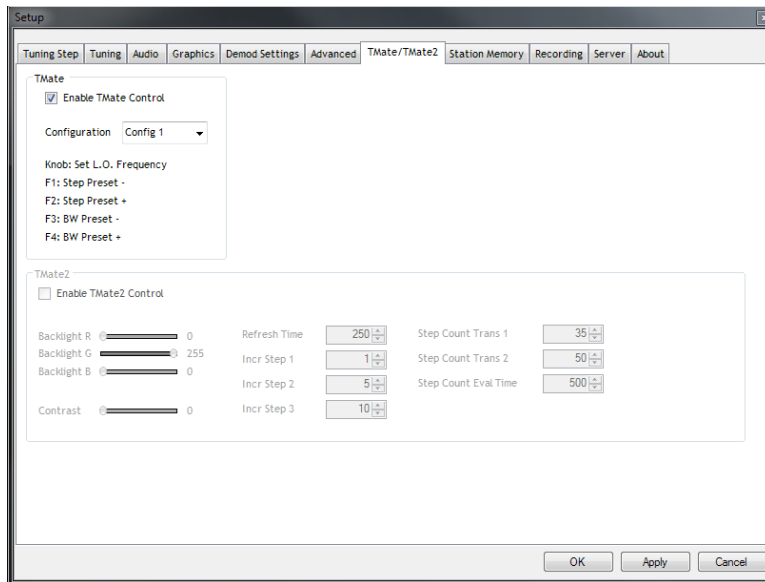
If “Panadapter Mode” is activated (the “Status Bar” displays the **PAN** label), the user can configure the IF frequency for the different demodulation modes and the amplitude offset that allows the right visualization. Moreover, the spectrum flip around L.O. frequency can be enabled by check “Swap I/Q” option (the “Status Bar” displays the **I/Q Swap** label). This configuration parameters can be saved/loaded using the buttons and respectively.

Enabling the AOR AR8600 Control (the “Status Bar” displays the **AR8600** label), the SW can directly control this Radio through serial communication.

3.6.4 Downconverter

If “Downconverter Mode” is activated (the “Status Bar” displays the **DW CONV** label), the user can configure the IF frequency shift of the downconverter and the amplitude offset that allows the right visualization. Moreover, the spectrum flip around L.O. frequency can be enabled by check “Swap I/Q” option (the “Status Bar” displays the **I/Q Swap** label).

3.7 Tmate/Tmate2 Tab

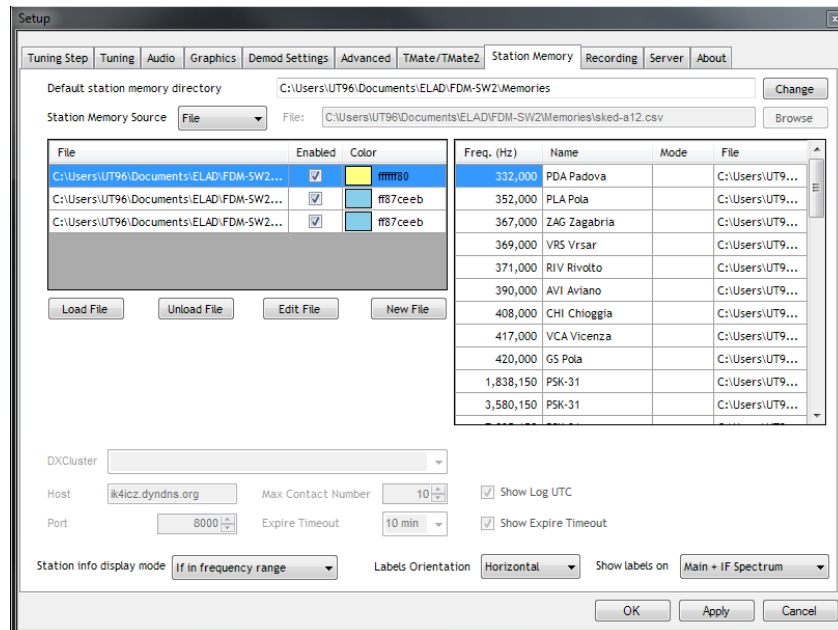


If a Tmate is connected, the “Tmate Panel” is activated. In this panel, the user can choose among the proposed configurations of Tmate’s button functions. When the Tmate control is active, the “Tuning Commands Panel” displays the following labels:

- **TMate: Set LO** if **Look To CF**;
- **TMate: Set Tune** if **Look To CF** or **Look ABS**

If a Tmate2 is connected, the “Tmate2 Panel” is activated. In this panel, the user can set the display backlight color, the refresh time, the increment steps of the tree knobs and others timing parameters.

3.8 Station Memory Tab



In the FDM-SW2, three types of memory source are available:

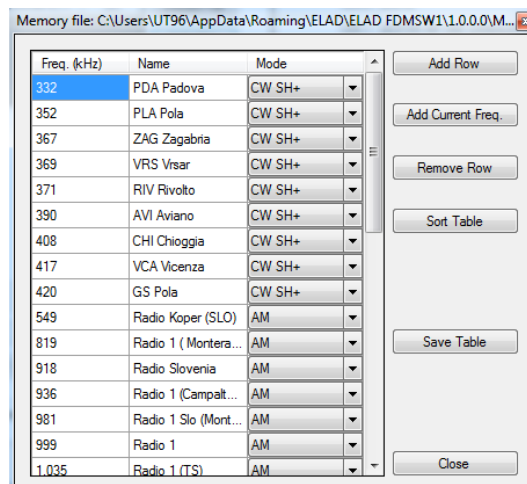
- Xml memory file;
- DX Cluster Connection;
- EIBI Database.

3.8.1 Xml memory file

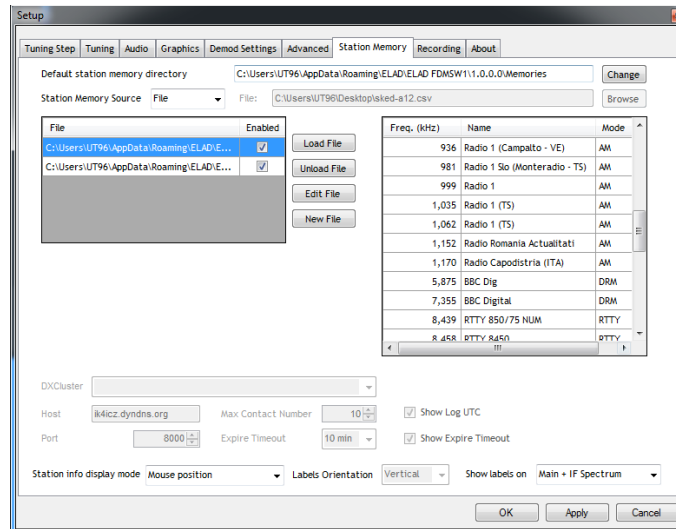
Select "File" as Station Memory Source.

Press **New File** button to create a new memory file.

When a new file is created or when **Edit File** button is pressed, FDM-SW2 visualizes an "Edit" form (represented in the figure below): user can add or delete stations from the editor to create or change a memory file.



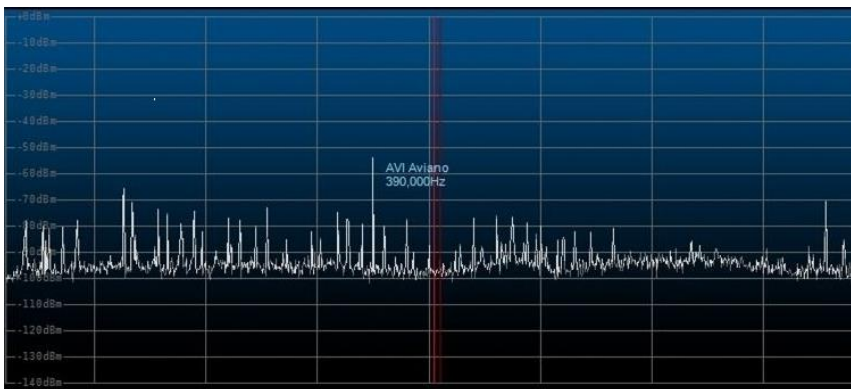
Press **Load File** or **Unload File** button to load or unload a memory file respectively (more than one memory file can be loaded at the same time).



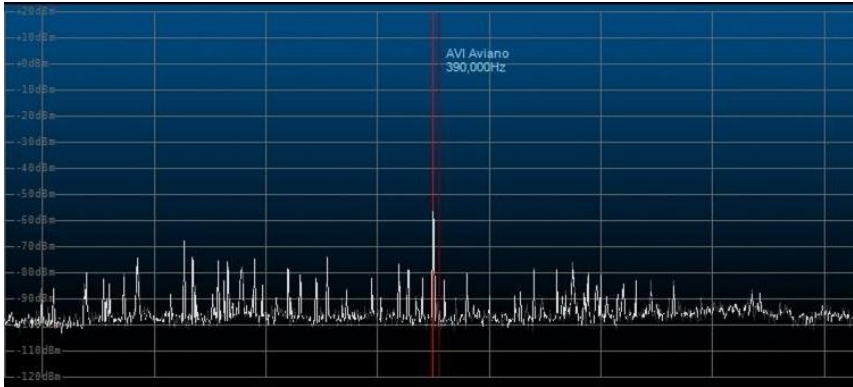
The table on the right side of the tab displays all the stations that are stored in the selected memory files.

The “Station info display mode” combo-box allows the user to choose 4 types of memories visualization on the Spectrum graphic:

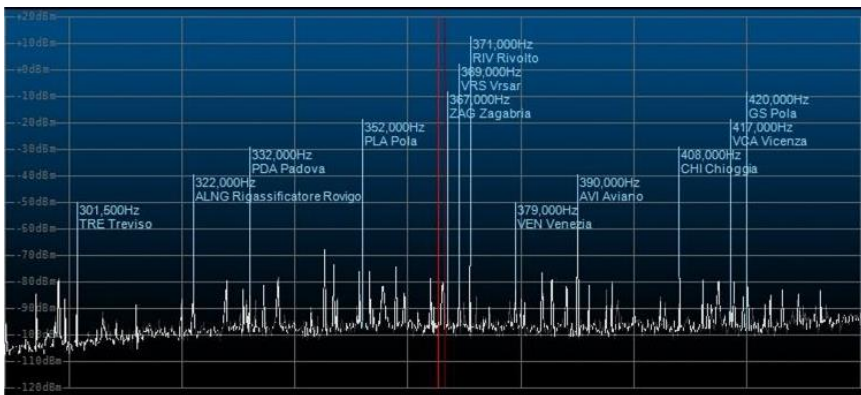
- “None”;
- “Mouse position”: a label containing the station info is displayed when the mouse is positioned over a frequency included in the selected memory files;



- “L.O. Frequency”: a label containing the station info is displayed when the L.O. frequency corresponds to a frequency included in the selected memory files;



- “If in frequency range”: a label containing the station info is displayed for each frequency included in the selected memory files that falls within the Spectrum frequency range.



If the option “If in frequency range” is selected, the “Labels orientation” combo-box, allow the user to select three types of visualization:

- Horizontal
- Oblique
- Vertical


Finally, the combo-box “Show labels on”, allow the user to enable the station memory label display on main spectrum window, on IF spectrum or on both the windows.

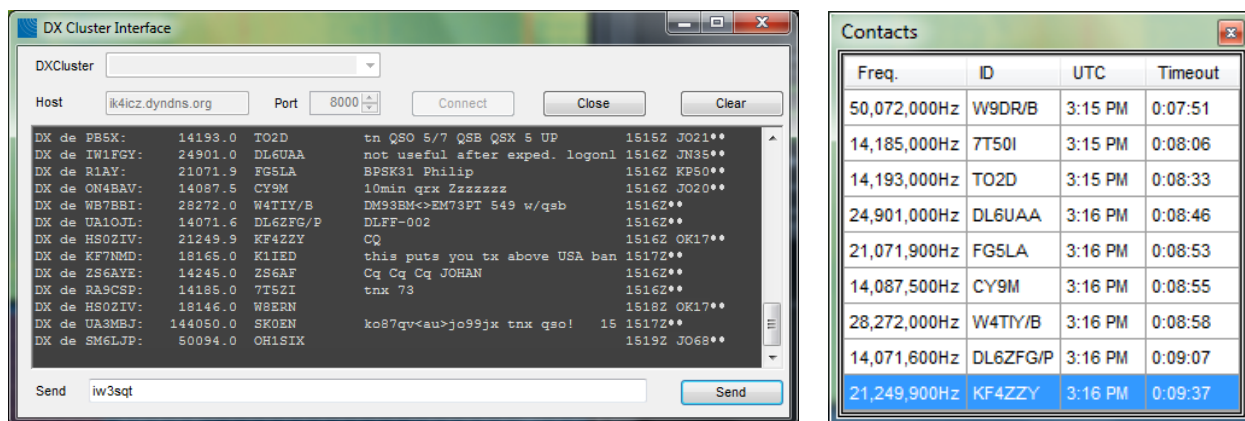
When the **MEM** button is clicked, FDM-SW2 displays the “Station List” form. Clicking on a line of the table implies that the receiver is tuned at the selected frequency and the mode is set at the value saved in the file.

Station List		
Freq (kHz)	Name	Mode
367	ZAG Zagabria	CW SH+
369	VRS Vrsar	CW SH+
371	RIV Rivolto	CW SH+
390	AVI Aviano	CW SH+
408	CHI Chioggia	CW SH+
417	VCA Vicenza	CW SH+
420	GS Pola	CW SH+
549	Radio Koper (SLO)	AM
819	Radio 1 (Monteradio - TS)	AM
918	Radio Slovenia	AM
936	Radio 1 (Campalto - VE)	AM
981	Radio 1 Slo (Monteradio - TS)	AM
999	Radio 1	AM
1,035	Radio 1 (TS)	AM
1,062	Radio 1 (TS)	AM
1,152	Radio Romania Actualitati	AM
1,170	Radio Capodistria (ITA)	AM
5,875	BBC Dig	DRM

3.8.2 DX Cluster connection

Select “DX Cluster” as Station Memory Source: all options for “DXCluster” source are available on the bottom area of the tab. Select a cluster from the “DXCluster” combo-box or insert manually the cluster settings. The “Station info display mode” combo-box displays the same options described in the previous paragraph.

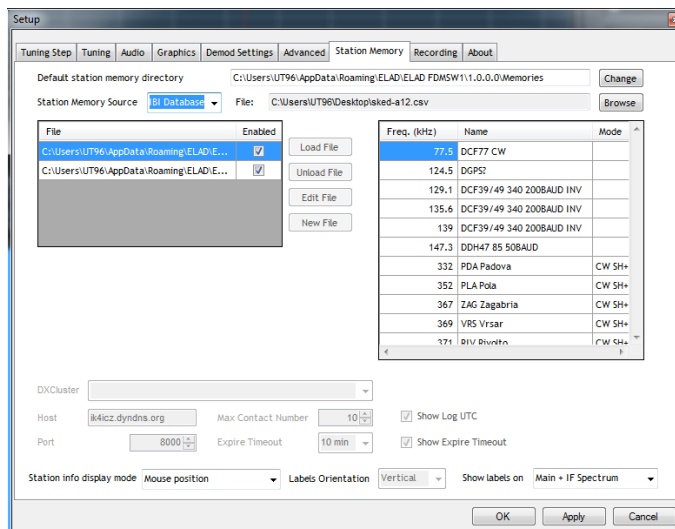
When the  button is clicked, FDM-SW2 displays the “DX Cluster Interface” form and the “Contacts” form.



Press **Connect** or **Close** button of the “DX Cluster Interface” form to open or close the link with the Cluster, and use **Send** to send the string entered in the “Send” area. The “Contacts” form displays the users connected to the cluster. Double-clicking on a line of the table implies that the L.O. is tuned at the selected frequency. Use the “Show Log UTC” and “Show Expire Timeout” checkboxes to enable or disable the visualization of this information in the “Contacts” form.

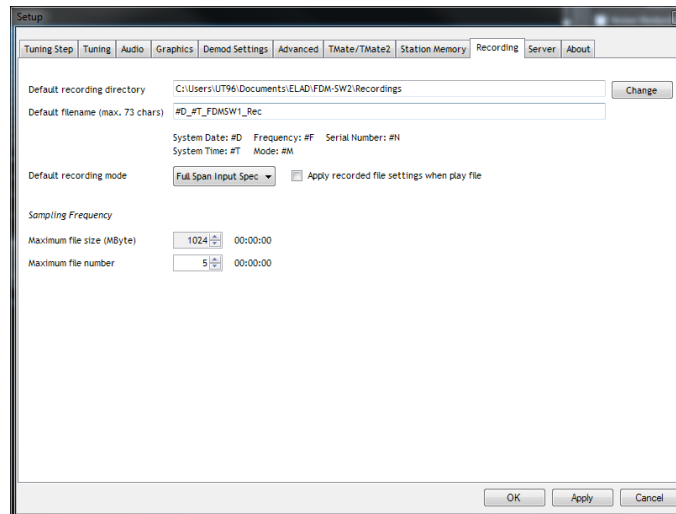
3.8.3 EIBI Database

Select “EIBI Database” as Station Memory Source. The “Station info display mode” combobox displays the same options described in the previous paragraphs.



Download the CSV database file from www.eibispace.de. Click the **Browse** button and select the downloaded .csv file.

3.9 Recording Tab



The “Recording” tab allows the user to configure:

- default directory for the recorded .wav files;
- default filename format. Use the following codes to customize the file name:
 - #D to insert the system date
 - #F to insert the tuning frequency
 - #N to insert the receiver serial number
 - #T to insert the system time
 - #M to insert the demodulation mode

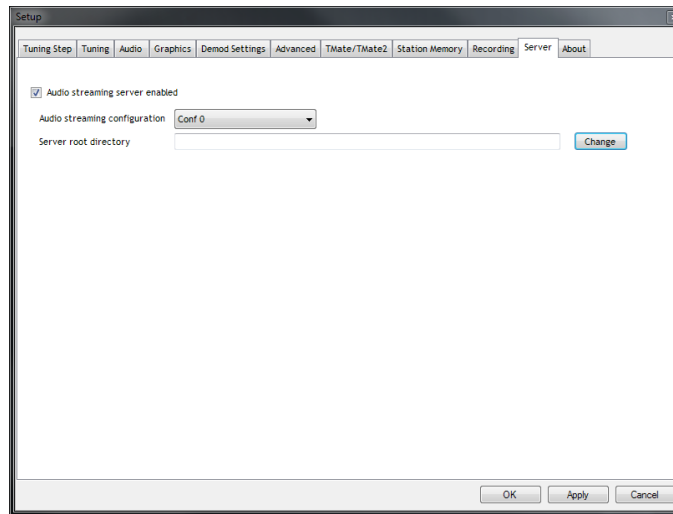
The SW automatically appends to the filename a prefix containing the data type (RF for “Full Span Input Spectrum” or AF for “Audio Frequency”) and a numeric suffix that represents the incremental index within a recording section;

- default recording mode:
 - Full Span Input Spectrum (the sampling rate of the RF I/Q datastream depends on the HW configuration DII loaded; see Chapter 6);
 - Audio Frequency;
- maximum allowed size for each recorded .wav files;
- maximum allowed number of .wav file for each recording session.

As explained in chapter 2.8, some information regarding the settings used during the recording and the playback (demodulation frequency, demodulation mode and filter bandwidth) of a .wav file is stored in its header.

If the ☒ **Apply recorded file settings when play file** checkbox is checked, the stored information is automatically loaded by the software at the beginning of the playback of every file even though the files belong to the same recording session. This may cause an unwanted change of configuration in the transition between a file and the subsequent. If the checkbox is unchecked, the software loads the information stored in the header of the first file of the recording session and keeps this configuration unchanged until the end of the reproduction of the whole session.

3.10 Server Tab



In this tab it is possible to activate the Audio Streaming & Web Control functionality. Please see the Annex B for details

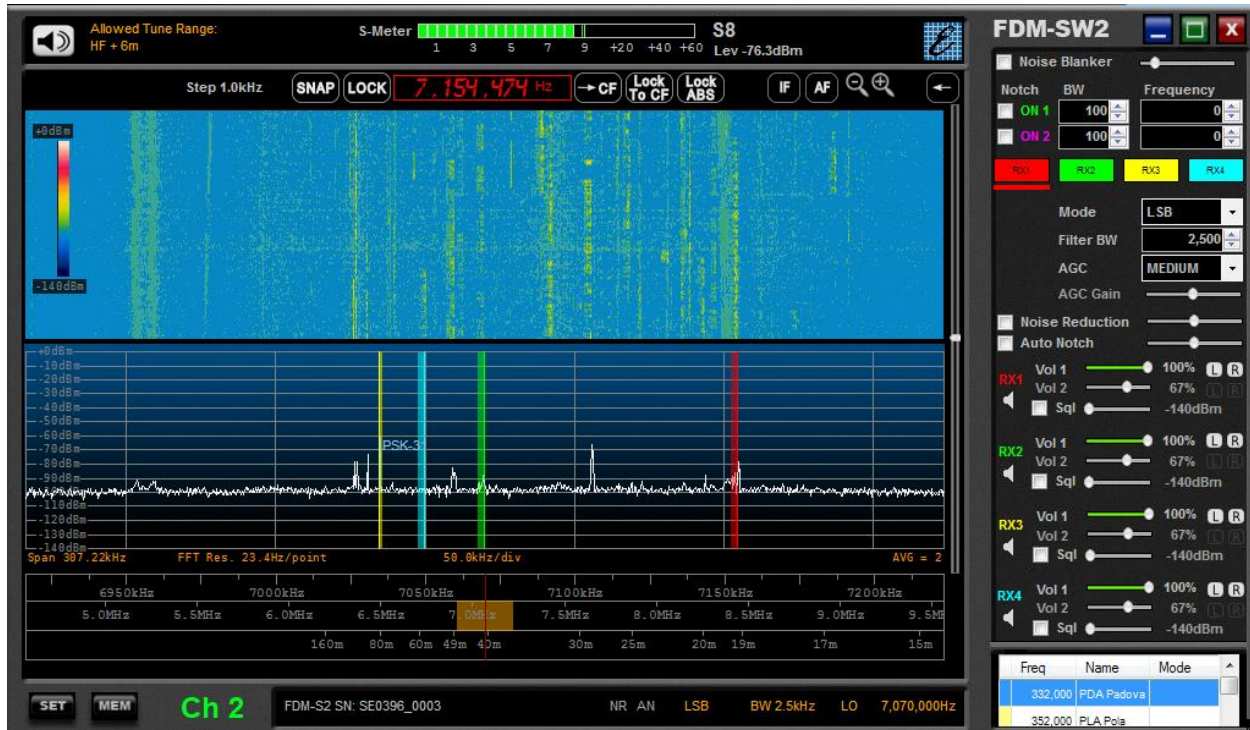
3.11 About Tab



The “About” tab displays useful information about Software and Hardware.


4 Channel 2 Spectrum Window

If the connected device is a FDM-S2 and a Two-channel configuration is selected, click on **CH2** button to open the Channel 2 spectrum window



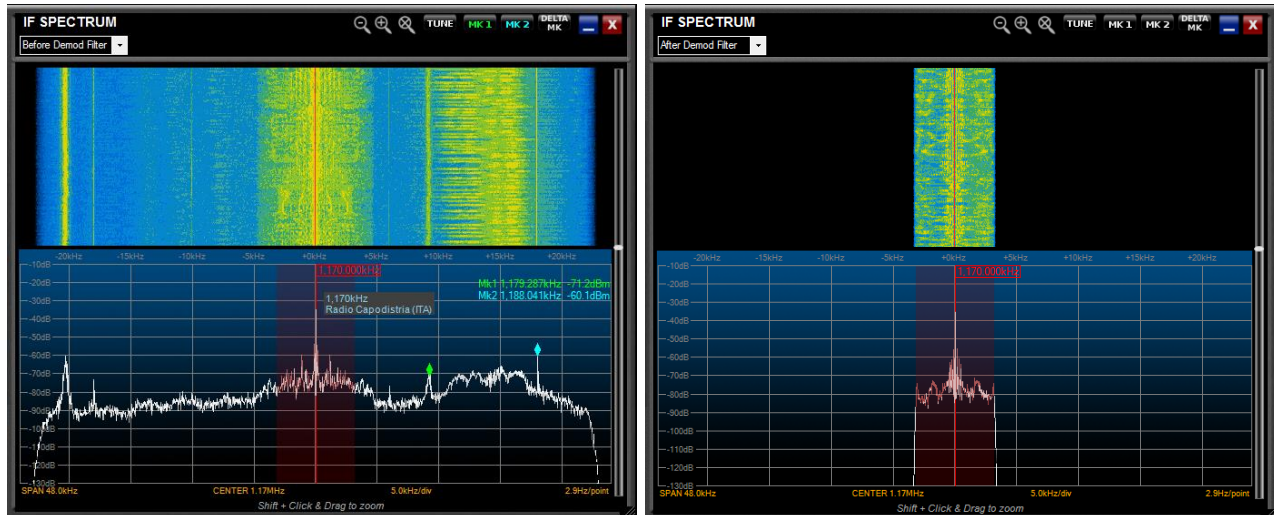
Note: If the option ☐ **Bypass Mode** (Exclude Preselector) in the “Advanced” tab the setup form is not selected, the local oscillator of the Channel 2, can be tuned only in the “Allowed Tune Range” displayed in the upper left corner of the window. This range depends by the frequency of the local oscillator in the main window.



5 IF Spectrum Form




If the ☒ **Show IF Spectrum Form** checkbox of the “Graphics” tab is selected (see Chapter 3.4), the “IF Spectrum” form is automatically loaded when the  button is pressed.

This form displays the Spectrum/Waterfall of the IF frequency of the software. The frequency span is set to 192 kHz when the “WB FM” demodulation mode is selected, 48 kHz for the other modes.

The user can select to visualize the Spectrum/Waterfall of the IF signal “Before Demod Filter” or “After Demod Filter”.



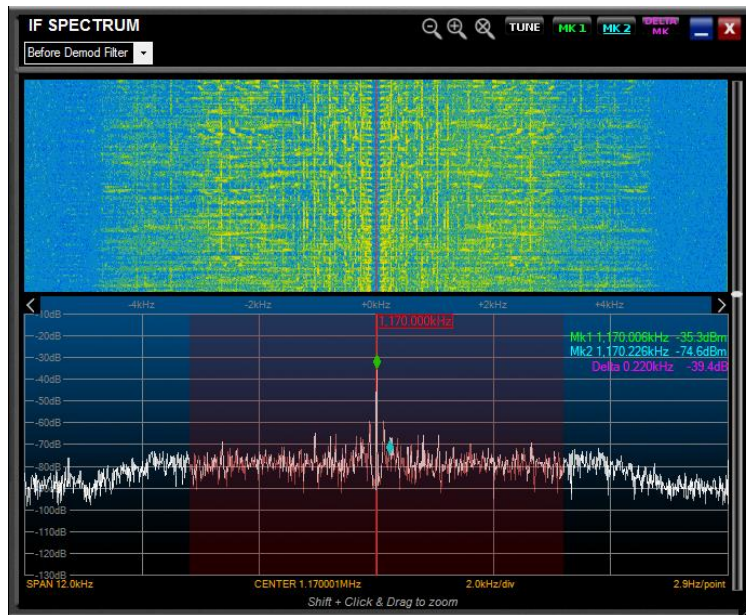
To zoom in/out the area of the tuning frequency, click on the  /  button.

To zoom a desired area, press the “Shift” button of the keyboard while operating the drag-and-drop action over the Spectrum. Use the arrows   when zoom function is active to move left/right the visualization and click the  button to reset the zoom.

User can perform three types of click function:


- set tuning to the selected frequency if **TUNE** is selected;
- set “Marker 1” if **MK 1** is selected (Note: the label is green (**MK 1**) when the “Marker 1” is enabled while is green and underlined (**MK 1**) when the click function is active);
- set “Marker 2” if **MK 2** is selected (Note: the label is cyan (**MK 2**) when the “Marker 2” is enabled while is cyan and underlined (**MK 2**) when the click function is active);

If both markers are enabled, user can activate the **DELTA MK** function that displays the frequency and amplitude difference between the markers.

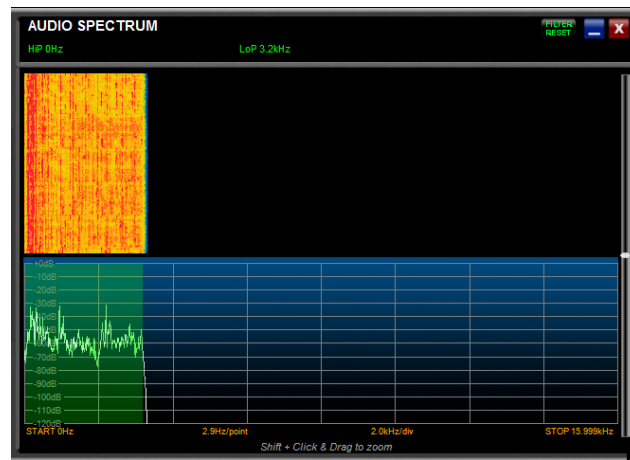





Drag-and-drop the bottom-right corner to resize the “IF Spectrum” form.

6 Audio Spectrum Form

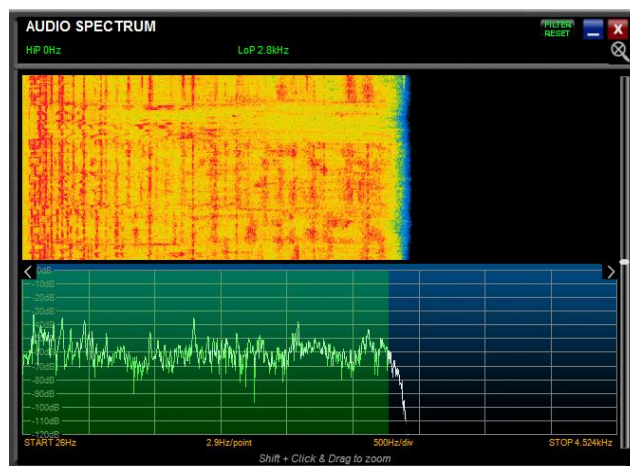
If the ☒ **Show Audio Spectrum Form** checkbox of the “Graphics” tab is selected (see Chapter 3.4), the “Audio Spectrum” form is automatically loaded when the  button is pressed. Furthermore, this form is loaded by default when the player is active and the data type of the reproduced .wav file is “Audio Frequency” (see Chapter 3.8).

The frequency span is set to 16 KHz for all demodulation modes.



To zoom a desired area, press the “Shift” button of the keyboard while operating the drag-and-drop action over the Spectrum. Use the arrows   when zoom function is active to move left/right the visualization and click the  button to reset the zoom.

In CW, CW SH+, CW SH-, USB, LSB, AM, FM, SYNC AM and DSB mode an audio filter is inserted at the end of the demodulation chain (audio filter is omitted in WB FM and DRM demodulation). This filter is represented by the green area drawn over the audio Spectrum. User can modify the bandwidth of the audio filter by drag-and-drop the borders of this area (Note: the higher frequency of the audio filter is limited to the bandwidth of the demodulation filter).

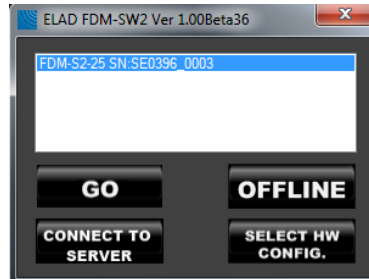


Drag-and-drop the bottom-right corner to resize the “Audio Spectrum” form.

7 FDM-SW2 Hardware Setup Form

☒ Show HW Setup Form At Startup
Receiver Mode

If the option of the “Advanced” tab is selected, the “FDM-SW2 Hardware Setup” form is loaded at software startup (see Chapter 3.6).



Press **GO** button to start the FDM-SW2.

Press **OFFLINE** button to start the FDM-SW2 in “OFFLINE Mode” (see Chapter 7).

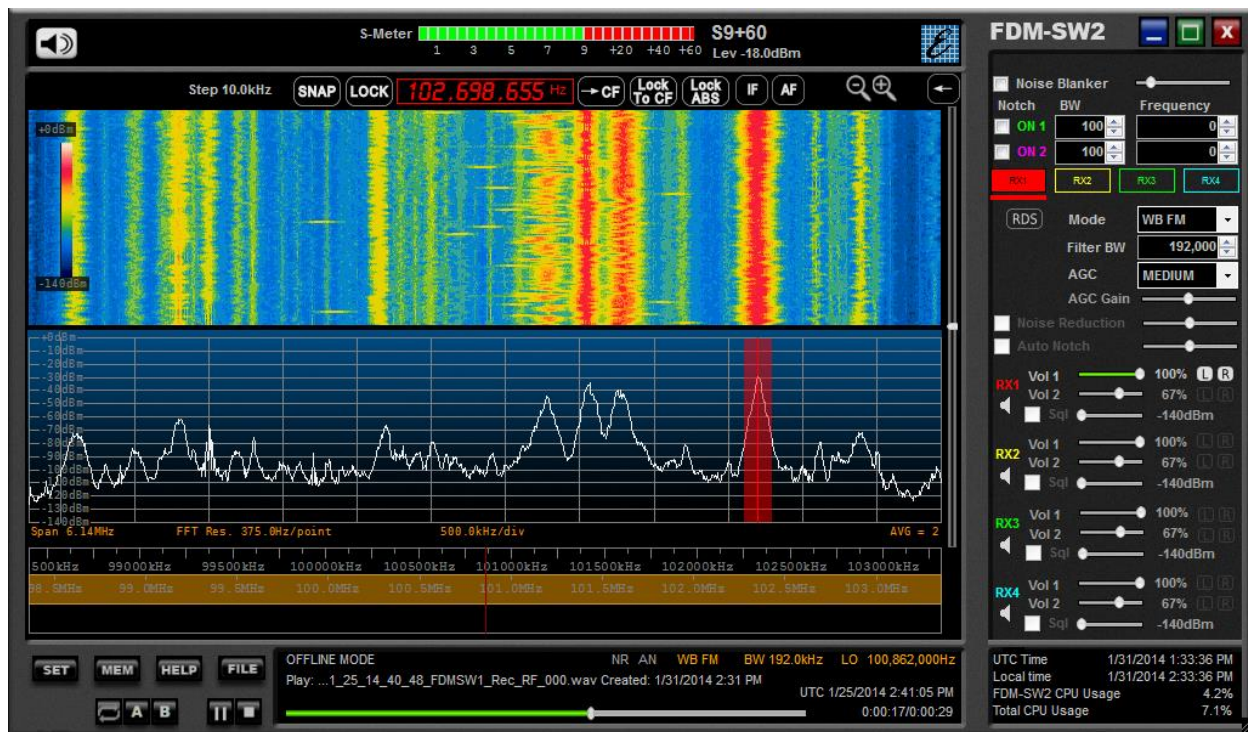
Since the FDM-SW2 is a general purpose software that works with the entire FDM-Sx Receiver family, the hardware configuration corresponding to the connected HW has to be selected. This operation is accomplished by clicking the **SELECT HW CONFIG.** button: a Windows dialog box is opened to allow the user to select the hardware configuration file (named ExtIOmc_ELAD_FDMSx_yyy.dll)

NOTE:

Please check out the latest update of your hardware related .dll file at www.eladit.com.

8 Offline Mode

If the **OFFLINE** button of the “FDM-SW2 Hardware Setup” form is pressed, FDM-SW2 starts in “OFFLINE Mode”. In this case, no connection with the hardware is established and only the playback of recorded files is available.



9 Connect to Server

Press the **CONNECT TO SERVER** button to connect the software to a remote FDM-Sx device through a server software (at the moment the server software is under development).

Annex A

ELAD FDM-SW2 CAT Protocol

The FMD-SW2 implements a subset of the CAT commands of the Yaesu FT-897 transceiver. The parameters of the serial port are listed in the following table.

Baud rate	38400
Data Size	8
Parity	None
Start Bits	1
Stop Bits	2

The command sent to FDM-SW2 consists of 5 bytes and is structured as follows:

Data 1	Data 2	Data 3	Data 4	Command
--------	--------	--------	--------	---------

FDM-SW2 software implements the following commands derived from the command set of FT-897:

Command Description	Data 1	Data 2	Data 3	Data 4	Command	Remarks
Set LO Frequency	100/10MHz	1MHz/100kHz	10/1kHz	100/10Hz	0x01	This commands sets the current frequency (see following command description)
Set operating mode	Mode Byte	X	X	X	0x07	See following command description
Read Receiver Status	X	X	X	X	0xE7	This command returns one byte containing receiver status (see following command description)
Read Frequency and mode	X	X	X	X	0x03	This command returns five bytes (see following command description)
Read EE prom Data	Address MSB	Address LSB	X	X	0xBB	This command causes two bytes of EEPROM data to be returned, beginning with the address in data bytes 1 and 2. (Approximately 6.25k of EEPROM data may be accessed - see following command description)
Read TX Metering	X	X	X	X	0xBD	This command returns one byte (00) when in receive. When in transmit, this command returns two bytes (in BCD format) indicating Forward power, VSWR, ALC, and Modulation.
Read Transmitter status	X	X	X	X	0xF7	This command returns one byte containing transmitter status (see following command description)
Set PTT ON	X	X	X	X	0x08	This "keys" the FT-817. In CW, this sets the radio to transmit mode, but does key the transmitter. Keying and unkeying the PTT line will cancel the transmit mode (i.e. put it back into receive.) This command returns 00 if the '817 was unkeyed, and F0 if already keyed.
Set PTT Off	X	X	X	X	0x88	This command puts the FT-817 into receive mode. This command returns 00 if the '817 was keyed, and F0 if already unkeyed.

Command Description

Command 0x01 - Set local oscillator frequency: the local oscillator frequency is set by the transmission of 4 Binary Coded Decimal (BCD) bytes. For example, to set the frequency at 435.12345 MHz the bytes to be sent are: **[43][51][23][45]** followed by the byte command **[01]**.

The command returns 1 byte set to **[00]**.

Command 0x03 - Read local oscillator frequency and mode: this command returns 5 bytes. The first four bytes contain the local oscillator frequency in the same format of the command **0x01** (4 BCD bytes), while the last byte contains the operating mode encoded as follows:

Mode	Value
LSB	0x00
USB	0x01
CW, CW SH+, CW SH-	0x02
AM, SYNC AM	0x04
FM, WB FM	0x06
DRM	0x07

Command 0x07 - Set operation mode: the first byte contains the operating mode that is encoded as follows:

Mode	Value
LSB	0x00
USB	0x01
CW	0x02
AM	0x04
WB FM	0x08
FM	0x88

The command returns 1 byte set to **[00]**.

Command 0xBB - Read EEPROM Data: this command returns 2 bytes. To simulate the behavior of the FT-897, the software replies to “Eeprom read” request as follows

Address	Data 1	Data 2
0x006A	0xC4	0x20
0x00A9	0x00	0x05
0x006B	0x20	0x59
0x008C	0x00	0x00
0x00A8	0x00	0x18
0x008E	0x40	0x00

For example, if the software receive the command **[00] [6A] [00] [00] [BB]** the answer must be **[C4] [20]**.

Command 0xBD - Read TX Metering: This command returns 1 byte set to **[00]** when receive mode is enabled, while it returns 2 byte set to **[00] [00]** when transmit mode is enabled.

Command 0xE7 - Read Receiver Status: This command returns 1 byte. The 4 least significant bits indicate the current reading of S-METER. Some examples are reported in the following table

Returned Byte	S-METER
0x00	S0
0x04	S4
0x09	S9
0x0A	S9+10
0x0B	S9+20
0x0F	S9+60

Command 0xF7 - Read Transmitter Status: This command returns 1 byte. If “keyed” the byte is set to [7f] otherwise [ff].

In addition to the controls derived from the command set of FT-897, the CAT protocol include specific commands for the FDM-SW2:

Command Description	Data 1	Data 2	Data 3	Data 4	Command	Remarks
Set operating mode SW2	Mode Byte	X	X	X	0xC7	See following command description
Read Tuning Frequency and mode	X	X	X	X	0xC8	This command returns five bytes (see following command description)
Set Tuning Frequency	100/10MHz	1MHz/100kHz	10/1kHz	100/10Hz	0xC9	This commands sets the current frequency (see following command description)
Read Locked Mode	X	X	X	X	0xCA	See following command description
Set Locked Mode	Locked Mode Byte	X	X	X	0xCB	See following command description
Read FDM-SW2 Status	X	X	X	X	0xCF	This command returns 10 bytes containing the FDM-SW2 status. (See following command description)

Command 0xC7 - Set operating mode SW2: the first byte contains the operating mode that is encoded as follows:

Mode	Value
CW	0x00
CW SH+	0x01
CW SH-	0x02
USB	0x03
LSB	0x04
AM	0x05
FM	0x06
DRM	0x07
WBFM	0x08
SYNC AM	0x09
DSB	0x0A

The command returns 1 byte set to [00].

Command 0xC8 - Read tuning frequency and mode: this command returns 5 bytes. The first four bytes contain the tuning frequency in the same format of the command **0x01** (4 BCD bytes), while the last byte contains the operating mode encoded as in command **0xC7**.

Command 0xC9 – Set Tuning frequency: the tuning frequency is set by the transmission of 4 Binary Coded Decimal (BCD) bytes. For example, to set the frequency at 435.12345 MHz the bytes to be sent are: **[43][51][23][45]** followed by the byte command **[C9]**. The command returns 1 byte set to **[00]**.

Command 0xCA – Read Locked Mode: this command returns 1 byte containing the receiver locked status

Mode	Value
Unlocked	0x00
Locked to CF	0x01
Locked ABS	0x02
LOCK	0x03

Command 0xCB – Set Locked Mode: this command returns 1 byte.

Mode	Value
Unlocked	0x00
Locked to CF	0x01
Locked ABS	0x02

Command 0xCF - Read Global Status FDMSW2: this command returns 10 bytes containing the status of the FDM-SW2

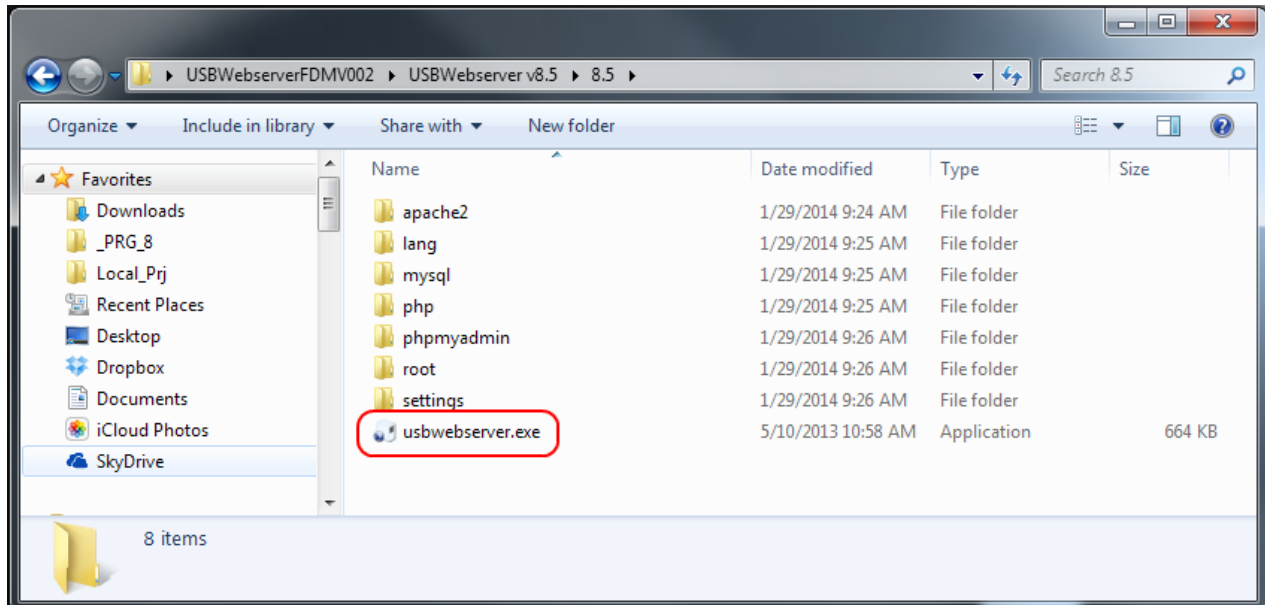
- **Byte 0:** Locked Mode (encoded as in command **0xCA**)
- **Byte 1 – Byte 4:** LO Frequency (4 BCD)
- **Byte 5 –Byte 8:** Tuning frequency (4BCD)
- **Byte 9:** Operating mode (encoded as in command **0xC7**)

Annex B

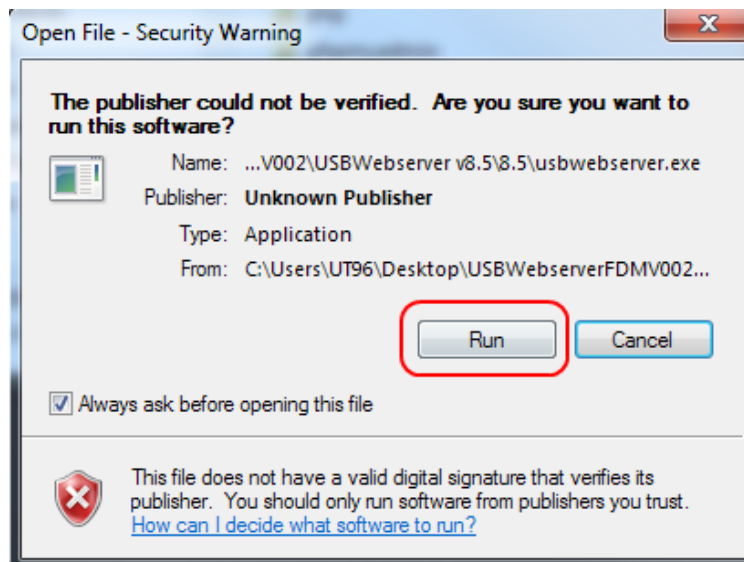
Audio Streaming & Web Control

Starting USBWebserver

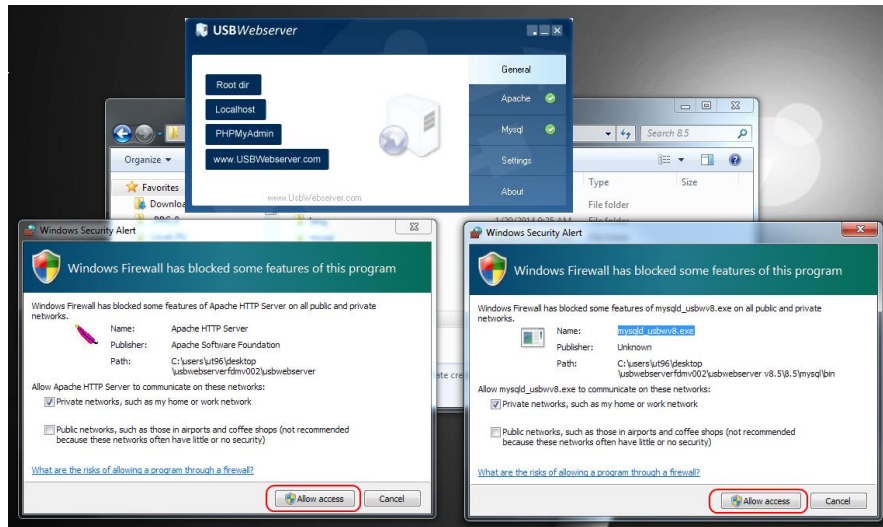
Open the folder USBWebserverFDMVxxx\USBWebserver v8.5\8.5 and launch the file usbwebserver.exe



If a security warning appears, click on “Run”

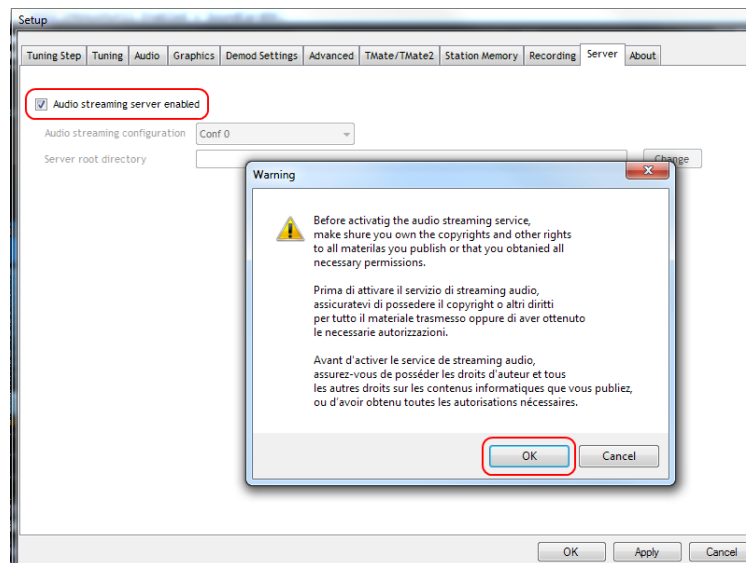


When the web server starts for the first time, two Windows security warning appears, click “Allow access” in both windows.



FDM-SW2 software settings

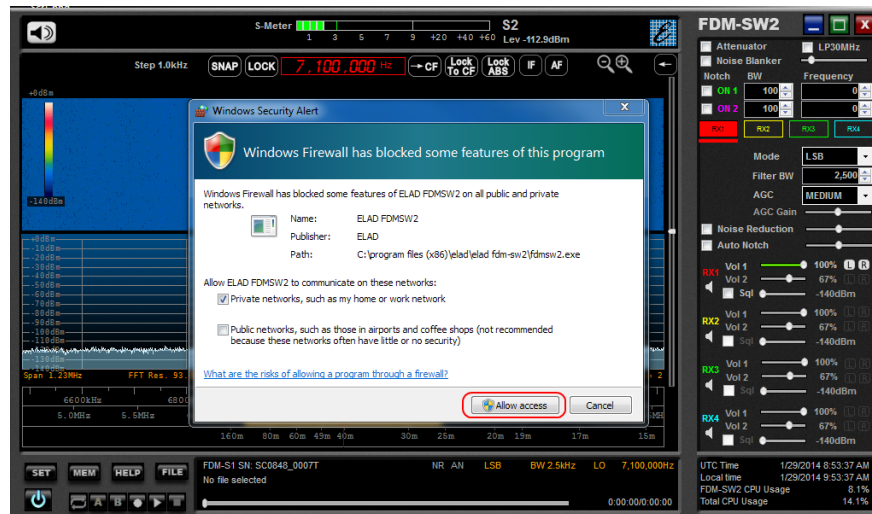
Open the FDM-SW2 software, open the setup widows by clicking on “SET” button and select the tab “Server”. Enable the check box “Audio streaming server enabled”. Read carefully the warning and then click “OK”.



Click on “Change” to select the USBWebserver root directory. Select the folder: USBWebserverFDMVxxx\USBWebserver v8.5\8.5\root

In the “Audio streaming configuration combo box” select “Conf 0”

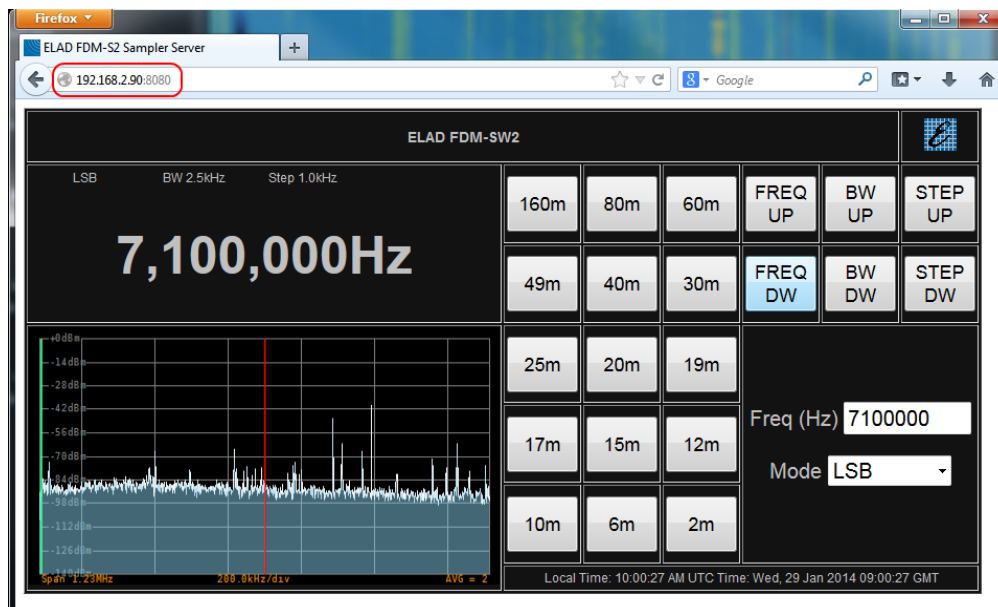
Once the setup is saved, when the receiver start the acquisition, a Windows security warning appears, click “Allow access”.



Use with web browser

The Audio Streaming & Web control feature works only with Firefox web browser. Open Firefox and type in the address bar:

"ip address of the PC where FDM-SW2 is running":8080



If you are interested only to hear the audio stream, type in the address bar:

"ip address of the PC where FDM-SW2 is running":1412

Audio Streaming Configuration Description

- Conf 0
 - Codec: OPUS
 - Input Bitrate: 48kHz
 - Bitrate: 32kHz
 - Audio encoding frame size: 2.5ms
 - Maximum band-pass: 20kHz
- Conf 1
 - Codec: OPUS
 - Input Bitrate: 48kHz
 - Bitrate: 6kHz
 - Audio encoding frame size: 10ms
 - Maximum band-pass: 4kHz
- Conf 2
 - Codec: PCM
 - Bitrate: 48kHz
- Conf 3
 - Codec: PCM
 - Bitrate: 8kHz

Annex C

Restore to Factory Default

The FDM-SW2 software settings are stored in some files:

- **FDMSW2SwSetup.xml**: contains FDM-SW2 general settings like main windows position and size, graphics settings, default directory for save the recordings ...
- **FDMSW2SwSetup_XXXXX**: specific settings for the connected receiver (where XXXXX is the FDM-Sx serial number, Offline for the offline mode)
- **FDMS2RxSetup_XXXXX**: specific settings for the virtual receiver
- **FDMS1Config.xml**: frequency related settings

If the files are corrupted or contains invalid data, the software can stop working correctly. However it is possible to restore the FDM-SW2 software in a stable state.

- Close the FDM-SW2 Software
- Open the FDM-SW2 configuration file directory:
"local drive"\Users\"your user name"\Documents\ELAD\FDM-SW2
- Move the following files in another directory the setup files.

Attention: by moving these files, you will lost all the user settings as last tuning frequency, demodulation mode, frequency related settings etc...

- Restart the software